Icebreaker Project

Fukushima Disaster

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What Happened

Nuclear power is controversially debated socially, politically, and economically due to the significance of past events. The Fukushima Daiichi Nuclear Power Plant event is past occurrence and is still an issue today. Today the Japan Government and Tokyo Electric Power Company (TEPCO) are trying to retain the damage of the plant. [3] Safety measures are increasing dramatically to decrease the radiation damages to the surrounding environment.

In March of 2011, off the east-coast of Japan, an earthquake of magnitude 9.0 caused a catastrophic nuclear power plant failure. [1] The initial earthquake shook and damaged many of the plants systems including most of the power lines and most of the reactors. The power lines that provided the plant with energy were severed, leaving the diesel backup generators to power the plant. At this time, the plant entered "Scram Mode." At this point, only the workers essential to the plant's safe shutdown remained onsite as all other workers evacuated.

During the construction of Fukushima Daiichi Nuclear Power Plant, extreme measures were considered to protect the power plant from hazardous events including natural disasters. Walls designed to protect the power plant from tsunamis were constructed to 6 meters in height. [5] Shortly after the earthquake, a 15 meter tall tsunami wave collided with the plant and flooded and damaged twelve of the thirteen diesel backup generators. [1] These generators were the last possibility of provided much needed coolant. The increasing temperature of the radioactive material increased the pressure in the reactors. A crack in reactor 1, which was caused by the initial shock, was leaking radioactive material into the flooded basement of the plant. An aftershock caused an explosion in reactor 1. This released radioactive material into the air. Power was eventually restored to the plant allowing for cooling water to circulate through the system. The plant continues to leak radioactive material into the ocean today. [2]

Current Issues

In the process of decommissioning the plant is being hindered by natural groundwater flowing into the damaged facilities. Consequently once the water enters the facilities it becomes contaminated and must be stored in temporary tanks since it can no longer be released into the ocean. The storage containers have since leaked about 300 tons of contaminated water have seeped into the groundwater. Investigators and officials from the International Atomic Energy

Agency (IAEA) were brought to sight in order to investigate the leaking and possibly offer a solution. [2]

Efforts to use a chemical barrier to prevent sea contamination have failed. In hopes of preventing additional leakage into the groundwater and ocean, there has been a proposal to construct an underground ice wall around the nuclear reactors. [5] Such a wall would be constructed by drilling holes into the ground and placing vertical piping around the perimeter of the reactors. A refrigeration plant would pump coolant through the piping that would eventually freeze the ground. [3] Ideally, this will cease the leakage to the ocean and groundwater to prevent further contamination.

The range of contamination has also increased since experts have reported "hotspots" of sediments contaminated with high levels of radioactive cesium offshore. To contain the radioactive water, TEPCO also will be building an offshore wall of steel panels along the coast, to keep radioactive contaminants from spreading further into the sea. [3]

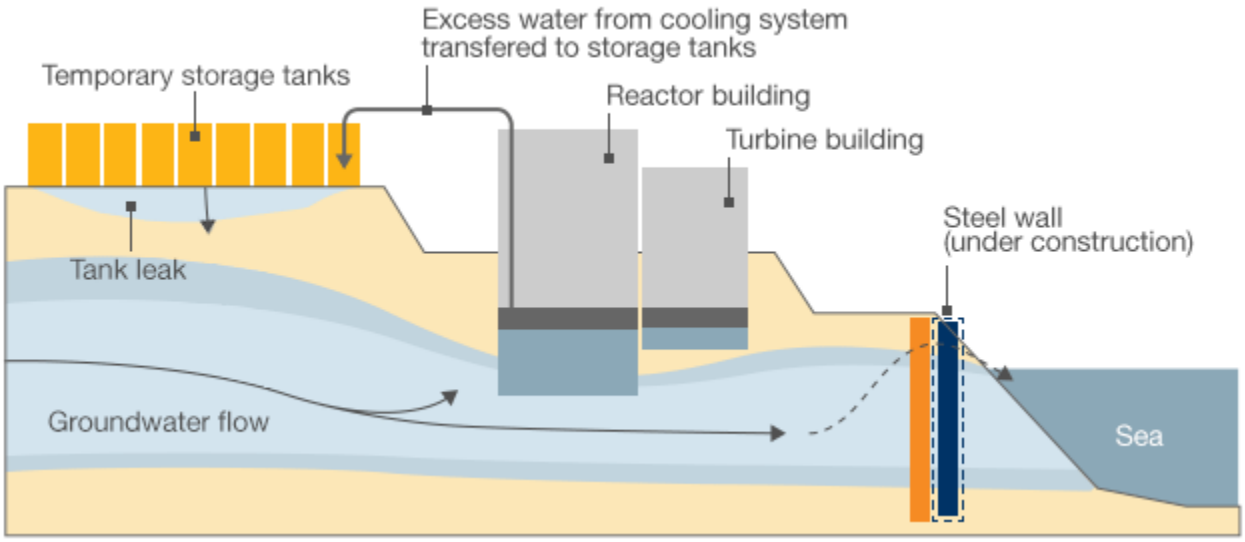

Figure 1 - Groundwater contamination at Fukushima and steel wall diagram [3]

In addition to the contaminated water leaks there are more issues that have arisen from the meltdown in March 2011. The main radioactive material, Cesium-137 has a half-life of 30 years, meaning that it could take up to three centuries for the radioactivity to disappear completely in the contaminated areas. [5] Agriculture is unable to be cultivated, regardless of how fertile, because of the soil's exposure to high radioactivity. Livestock and fish suffer and their habitats have also been compromised. This lead to a problem of finding food and water

sources on and off land. Furthermore, surrounding communities suffer from continuous power outages with only three of the original six reactors that are still in service.

Our Action Plan

If this disaster occurred in the United States and the power plant was under our team's control, our response would be much more safety-oriented. Our team would prioritize public and worker safety while also working on containment of the leaks then lastly, dedicating time to restoration of the plant. This team agrees that safety is most important in a disaster like this.

Once our team was put in control of the power plant, before a disaster hit, our first objective would be safety. Our plant would be brought completely up to date with all nuclear regulations. Professionals trained by the Nuclear Regulatory Commission (NRC) and the Institute of Nuclear Power Organizations (INPO) would be hired to inspect all aspects of our plant. These safety representatives would perform rigorous safety checks on every system of the plant and let nothing pass that wasn't within proper standards. Our representatives would also train the workers on plant safety and emergency procedures. Our team wants every person who steps inside the plant to be knowledgeable on what to do in an emergency.

Our plant would be extensively fortified against disasters. Our team would consult previous nuclear power plant failures to create the optimum design for ours. The most important aspect in our design would be protecting the backup generators that provide coolant during a loss of power. A part of this design component would be to ensure that the plant would have no major underground components to protect the plant against flooding. To further protect the plant from disasters, early detection systems would be integrated into the plant. These systems would be able to detect potential emergencies and instantly alert workers of the threat.

If a disaster ever did cause such a dangerous failure of our plant, three separate teams would be put into action. The first and most important team would work on containing the outbreak and initiating an evacuation if necessary. Their goal would be to keep as many people safe as possible. This team is mainly composed of a quick reaction force that would be extensively trained on emergency procedures and containment protocol. This team would be on alert at all times and ready to respond to any foreseeable emergency. The second team would be dedicated to the restoration of the damaged areas of the plant. Following all safety procedures, this team would work on stopping contamination from the source. Then it would begin restoring

and reconstructing the plant to be even more fortified against a similar emergency in the future. The third team's mission would be medical response and communication. This team would be providing medical care for those affected by the disaster and providing information to the public about the quality and living conditions of the areas around the plant. The medical team would work closely with hospitals and, if necessary, the National Guard.

Our team's priority is safety. The first steps we would take in controlling the power plant would bring the entire plant up to the regulations of the NRC and the INPO. The most important process of our action plan is ensuring as many people as possible can walk away from the incident unharmed.

Work Cited

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